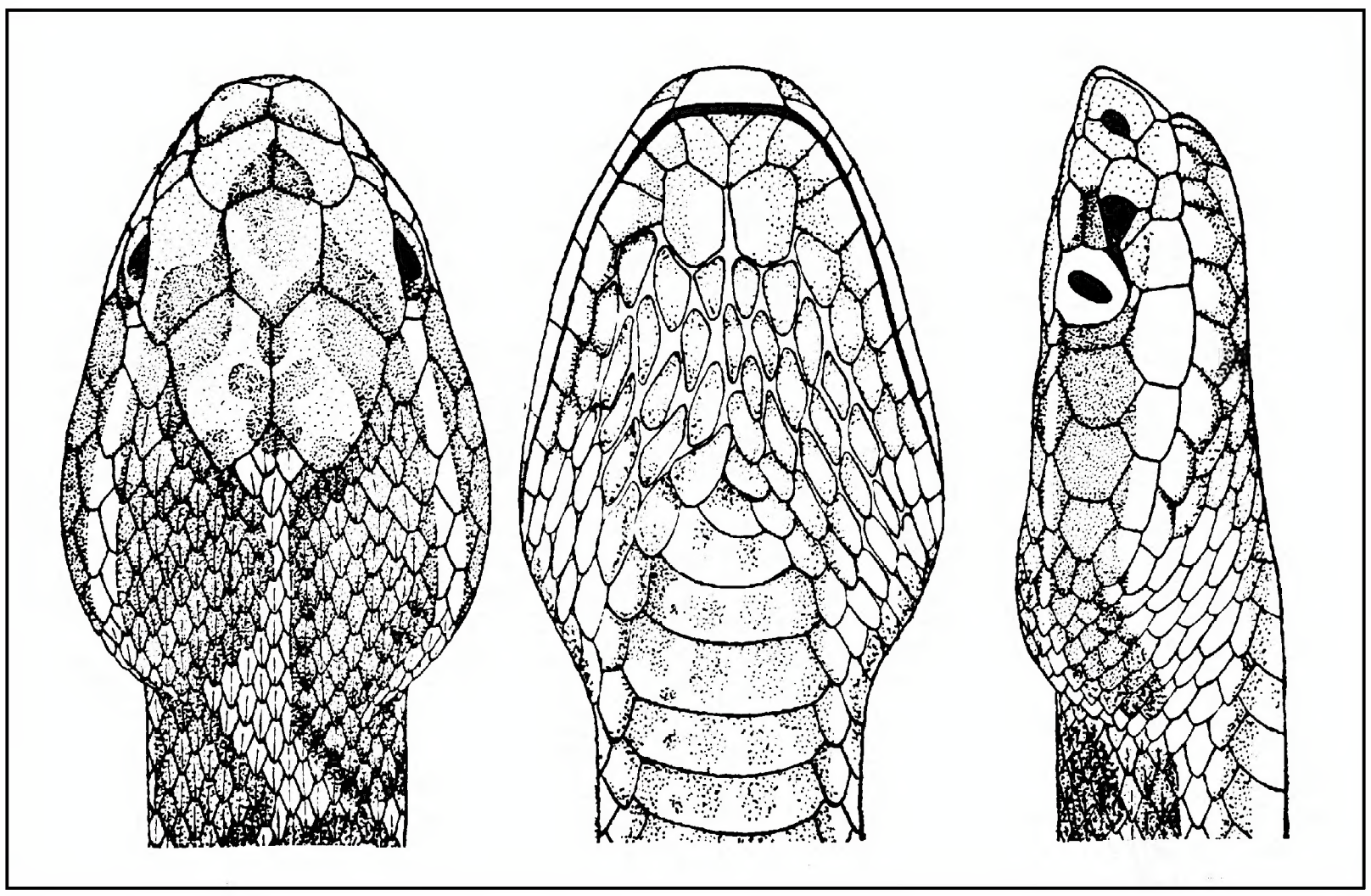
BULLETIN
of the
Chicago Herpetological Society

Volume 47, Number 11
November 2012



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Two-headed Snakes Make High Maintenance Pets . . . . . Van Wallach 137

The Hole in the Wall Gang . . . . . Stephen R. Johnson and Mary Stark 140

Notes on the Herpetofauna of Western Mexico 7: Reproduction of *Plestiodon callicephalus* in Jalisco, Mexico . . . . . Ángeles Penilla-Juárez, Daniel Cruz-Sáenz and David Lazcano 141

Herpetology 2012 144

Unofficial Minutes of the CHS Board Meeting, September 14, 2012 147

Advertisements 148

Cover: Mamushi, *Gloydius blomhoffii*. Drawing (as *Agkistrodon halys blomhoffii*) from *A Monograph of the Snakes of Japan* by Moichiro Maki, 1931.

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The *Bulletin of the Chicago Herpetological Society* (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society, 2430 N. Cannon Drive, Chicago IL 60614. Periodicals postage paid at Chicago IL. **Postmaster:** Send address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago IL 60614.

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Bull. Chicago Herp. Soc. 47(11):137-139, 2012

Two-headed Snakes Make High Maintenance Pets

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Introduction

Two-headed, or dicephalic, snakes are marvelous freaks of nature. The general term encompasses a variety of conditions from two-nosed and two-tailed snakes, two-headed and two-bodied snakes, and even conjoined twins. There is only one book on the subject, now 75 years old, detailing 225 cases of 44 species in 29 genera (Cunningham, 1937). A review five years ago summarized our knowledge of dicephalic snakes as follows: a total of 950 cases including 169 species from 93 genera (Wallach, 2007). Currently there are 1350 cases known with 191 species in 103 genera.

Unfortunately, most of them drown in the egg, are stillborn, or die shortly after birth. The ratio of dicephalic monsters to normal individuals in wild populations of snakes has been estimated in various publications as between 1 in 20,000 and 1 in 100,000 births ($\bar{x}$ = 1 in 67,500, n = 4). However, based on a survey of breeders, the frequency of captive-born dicephalics is significantly greater, between 1 in 120 and 1 in 10,000 ($\bar{x}$ = 1 in 2,667, n = 17). This implies that captive-bred dicephalics are 25–100 times more frequent than wild born monsters. Among the dozen possible causes of axial bifurcation, the two that most likely are responsible for the increased frequency of two-headed snake births are inbreeding depression (including back-crosses, hybridization, albinos, siblings, designer morphs, etc.) and temperature fluctuation during incubation (either high or low).

Husbandry

A major cause of death in two-headed snakes is their inability to normally pip the egg and crawl out on their own. Thus, many specimens that could survive end up drowning in the egg, unbeknownst to the breeder. Most of the "did not hatch" specimens were untouched by the breeder until a day or two after the last normal neonate was born. If they had been noticed earlier and given assistance in getting out of the egg they probably would have survived. It is therefore important to keep an eye on any egg that does not pip with the others and open it to allow a suspected dicephalic to emerge. Sometimes one head will pip the shell but the other one cannot.

After a dicephalic has been born alive (and hopefully in good health), it faces numerous problems in comparison with its normal siblings. Feeding on its own is impossible. Two-headed snakes have heads that are smaller than those of equal sized individuals; my snake's heads were 20% smaller than normal Lampropeltis triangulum of equal size. So feeding the neonates is especially difficult. Not only do you have to provide food that is acceptable, it also has to be smaller than normal. My snake, although native born in Maine where lizards do not exist, completely refused all manner of invertebrates and pinkie mice. It finally was enticed to eat a skink from Louisiana and the scent was applied to the pinks in succeeding weeks until it was weaned off lizards and started taking mice on its own.

Locomotion is normally very difficult with two brains competing for the control of one body. This results in the typical wavering or vibrating motion that reflects the struggle of each head to go in a different direction. Given time, one head will normally become dominant and take over the business of crawling, at which time it will become smoother. Any undue excitement will usually elicit the quivering behavior once again.

Shedding presents additional problems as the skin will not come off any further than the bifurcation of the necks. The skin must be cut between the necks to allow the snake to crawl completely out. As the snake gets older and stronger it can tear the skin at the neck juncture and may still shed properly.

My snake disliked any type of water. Although it would drink out of its water dish, it never voluntarily soaked (even before shedding) and whenever it was placed in a larger container with water, it swam frantically towards the bottom of the dish. It never would find its way back to the surface but would continue to swim around the bottom of the container. This must have had something to do with its double nervous system.

Care must be taken with the objects placed in the dicephalic's cage. Whereas most snakes need a box to hide in or some covering shelter like bark or wood, such items can be disastrous (and lethal) to a two-headed snake. When one head goes on one side, and the other head on the other side, with something in between, danger lurks! The snake is not smart enough to decide to back up and go a different way. Instead, both heads will continue to press forward and, at the least, cause damage by abrading the scales in the fork of the neck.

"Brady & Belichick"

I was given a wild-caught, newborn eastern milksnake (*Lampropeltis t. triangulum*) from Winthrop, Maine (44°20'08"N, 69°59'06"W), on 27 October 2004 (Wallach, 2005). The hatchling, collected 26 September by Glen Tricarico in a rock wall in his back yard, was a 200 mm long female that weighed 4.0 g. Its

Discovered in a rock wall—first photo—taken before capture. Photograph by Glen Tricarico.

Caged hatchling prior to its first shed. Photograph by Glen Tricarico.

Each to its own. Photograph by Van Wallach.

first shed occurred on 7 October, indicating that it was collected shortly after birth as newborn snakes generally shed within the first 7–10 days. This snake refused all offered food items (crickets, earthworms, slugs, mealworms, and mouse tails and feet) for more than five weeks until I obtained some juvenile little brown skinks (*Scincella lateralis*) from Louisiana. Upon placing a live skink in the container with the snake, the snake started twitching and thrashing around and the left head grabbed the skink whereupon the right head (which turns out was the dominant one) attacked its left counterpart! While the left was trying to swallow the wriggling lizard, the right was chewing on the left head. After separating the heads I broke the lizard in half and gave part to the right head so that both heads had something to swallow. After that it was just a matter of rubbing skink scent on the smallest pinkie mice (1 g) I could find to entice the snake to feed. On 18 November it took its first non-scented mouse and feed on mice the rest of its life without any problem except for size.

It lived for exactly 6.5 years until I accidentally overheated it while soaking it before shedding. During that time it grew to 815 mm and weighed 160 g (averaging 95 mm/yr and 23.7 g/yr). It shed 51 times (mean shed interval 43 days with an average of 8 sheds/year). It ate 663 meals with the right head eating 490 times (78.6%) and the left head 173 times (21.5%). Total weight of all mice consumed was 1413 g (1110 g by right head, 300 g by left). Because each head was 20% smaller than the head of a similar-sized milksnake, the largest mice it ever ate weighed 7 g. It preferred pinkies weighing 2–4 g.

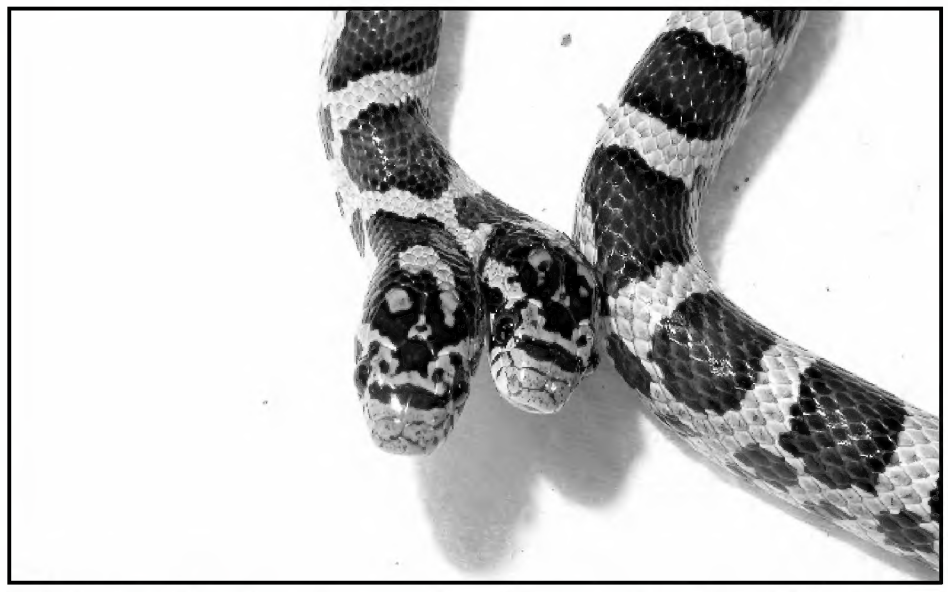
One time the right head grabbed a fuzzy in the middle and worked around to the rear of the mouse. After struggling unsuccessfully for an hour to swallow it backwards I pulled the mouse out and turned it around and the snake promptly ate it. It also helped on many occasions to cut the appendages off the pinkies before feeding them to the snake. Sometimes both heads would end up swallowing the same mouse, one from each end, and then I would have to separate them.

Each head was offered mice at every feeding: sometimes both heads would feed simultaneously, less often only the left head would eat, and most frequently just the right head would feed. But there were no patterns. During its first year, the right head ate 35 times, the left head only 10 (ratio of right/left = 3.5) but in year two (from 23 Oct. 2005 to 23 July 2006) the right head ate 15 times, the left head 30 times (ratio = 0.5) or 23 October 2005 to 17 March 2006 the left head ate 17 times, the right head only 3 times (ratio = 0.18). All other years the right head ate 2.5–7.5 times as many meals as the left.

It was discovered early by a barium X-ray on that the snake had two separate stomachs, the right stomach twice the diameter of the left, the digestive tracts joining at the pyloric junction.

Right head (Belichick) chomping on left head (Brady). Photograph by Van Wallach.

Right head stealing a pink that the left head had started swallowing. Photograph by Van Wallach.



Belichick and Brady at 2 years of age. Photograph by Van Wallach.

Therefore it was safe to allow both heads to swallow mice simultaneously. During the first year, the snake was so small it took 15–45 minutes to swallow even the tiniest pinkie. A 1 g mouse represented 25% of the snake's body weight.

The snake learned several things during its lifetime (Wallach, 2006). A couple involved feeding behavior. During the first two years, whenever both heads were feeding and one head would finish a food item, it would then attack the other head and start chewing on it (whereupon they had to be carefully separated). Placing a card between the heads prevented one head from attacking the other. And after a few years, neither head would attack the feeding head.

When only one head was feeding, the opposite head would not hold still and let the feeding head swallow its mouse. The non-feeding head would crawl around the cage apparently oblivious to the action of the feeding head and this often prevented the other head from successfully swallowing its meal with the mouse being dragged loose from the snake before it got most of it down its throat. After about a year the left head learned to cooperate when the right head was feeding and remain passive until the right head was finished; however, the right head never learned to do that and it continually crawled around while the left head was attempting to swallow a mouse.

When swallowing a mouse the snake never used an S-shaped kink in its neck to force the food into the stomach. Instead, it would just compress the neck anterior to the food and force it posteriorly.

One time the right head ate a mouse, a second mouse was offered but refused, and it was then given to the left head, which started eating it. The snake was crawling around so vigorously that it eventually knocked the mouse out of the left head. The left head again found the mouse and had it three-quarters swallowed when the right head started thrashing around (like a snake

Belichick and Brady after death. Photograph by Van Wallach.

does when it wants to regurgitate a meal) as if it didn't want the left head to eat. As the left head was nearly finished swallowing its mouse, the right head opened its mouth wide four times and kinked its neck as if to regurgitate the mouse! Once the left head's mouse reached the throat the regurgitation reflex of the right head stopped. Then each head fought to be in a superior position as in male combat. This happened about a half dozen times.

On two occasions in 2005, when taken outdoors, the snake crawled backwards as easily as forwards, with the tail smoothly leading the way! The first time this happened there were two witnesses, the second time there were four. However, I was unable to capture this movement on video so it is undocumented. As the snake grew larger it never crawled backwards again.

In 2006 it escaped and was missing for six weeks but one night I found it on the floor, dehydrated and thirsty. It drank water for five minutes straight. It lost 19 g of body weight (6.4%) during the 7-week fast. In addition to its 6-week forced fast of 27 September–13 November 2006 when it escaped, the snake voluntarily fasted several times and neither head would eat: 5 weeks from 5 April–22 May 2007, 5 weeks in 13 June–23 July 2009, 8 weeks from 23 July–24 September 2009, and 8 weeks from 6 November–24 December 2010. One other escape occurred. After a feeding on 4 May 2009 the cage lid was not securely snapped down and the snake got out and crawled into a heating duct vent and curled up. It was found the next morning after a short search.

The study of the anatomy and behavior of dicephalic snakes fascinates and intrigues me and I would like to hear from anyone who has unpublished information about any specimen. A monograph documenting all known cases is currently in progress.

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Bull. Chicago Herp. Soc. 47(11):140, 2012

The Hole in the Wall Gang

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While making a short visit to Saint Feriole Island on the Wisconsin side of the Mississippi river we were fortunate enough to observe a small contingent of what must be a larger local population of northern water snakes (*Nerodia sipedon sipedon*). The first snake we encountered was much like other northern water snakes seen elsewhere in Iowa and like those that I (SJ) have seen in eastern Virginia; dull in coloration, having grayish-tan ground color with dark gray bands, as depicted by Johnson (2000) and by Oldfield and Moriarty (1994). It was basking on a sidewalk bordering the St. Feriole public garden and blocked from the river by a white painted stone and mortar wall and a 30 foot drop. On seeing us the snake did not resort to pugnacious display as described by Oldfield and Moriarty but instead tested the air with its tongue and painstakingly retreated into a hole in that wall. By the time it ceased moving, apparently behaving as if we were no longer witness to it, about 3 inches of tail still protruded. This behavior seems very much akin to overwintering behavior described by Breckinridge (1944). This site did not however seem an adequate equivalent of a rock crevice but might suffice for a smaller individual. Furthermore, the hole did not face the river and it was equidistant from either end of the wall making the trek for an overwintering snake a minimum distance of 25 lateral feet in addition to the 20 to 30 foot drop to the river.

About half an hour later, while inside a small museum and overlooking the river from a large deck we saw another and much more brightly colored water snake. My (SJ) first reaction was that we were seeing a northern copperhead instead of the copperhead's congener the water moccasin that people apparently confuse with the northern water snake (Oldfield and Moriarty, 1994). This particular northern water snake had a basal coloration of lighter yellow with distinctly reddish brown bars. We watched the snake for several minutes as it progressed northward along the pebble strewn shoreline and as its head and fore section dove to apparently forage by a boulder. The snake looked much more like the midland water snake (*Nerodia sipedon pleuralis*) described by Johnson (2000). The extreme differences in the body coloration between these two individuals clearly match the description of variability within the species as described by Tennant and Bartlett (2000), who state that "perhaps the most outstanding attribute of the northern water snake is the variability of its appearance."

Since the time of our observations in early June 2012 the severe drought increased over the summer and even dried portions of the Mississippi. Our observations occurred when the drought was only beginning. We can only hope that conditions at St. Feriole haven't deteriorated to the point where the water snakes are impacted. We will return to St. Feriole next spring to explore the fate of these snakes of the hole in the wall gang.

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Bull. Chicago Herp. Soc. 47(11):141-143, 2012

Notes on the Herpetofauna of Western Mexico 7: Reproduction of *Plestiodon callicephalus* in Jalisco, Mexico

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Abstract

We collected a pregnant female mountain skink (*Plestiodon callicephalus*) and the eggs from two nests of this species from the vicinity of Huaxtla, Zapopan, Jalisco. The female was kept in captivity until oviposition. All eggs were kept until hatching. We report on behavior we observed that we characterize as parental care. We provide information on clutch size, egg size and hatchling size in this species.

Resumen

Fue colectada una hembra y dos nidos de *Plestiodoncallicephalus* en la localidad de Huaxtla, Zapopan, Jalisco. Estas fueron mantenidas en cautiverio hasta que se llevo a cabo la puesta del nido y posteriormente la eclosión de las crías. Se observaron algunas conductas de cuidado parental y fueron caracterizados los huevos y el tamaño de las crías. Con este trabajo pretendemos aportar información sobre la caracterización de los tamaños de los huevos y crías de esta especie.

Introduction

Campbell and Simmons (1961) collected a female mountain skink (*Plestiodon callicephalus*) and its nest of three eggs from a locality near Guadalajara (Table 1). All three eggs hatched but one of the babies could not be found and was presumed to have been eaten by the mother. Campbell and Simmons reported measurements for the remaining two hatchlings (Table 2).

Zweifel (1962) reported on a female *Plestiodon callicephalus* that had been collected in the state of Nayarit and subsequently laid six eggs. Zweifel included measurements for three of the eggs (Table 1). Zweifel assumed oophagy because of the disappearance of one of three eggs that had been left in the cage with the mother and another skink. Oophagy has also been documented for brooding prairie skinks (*Plestiodon septentrionalis*) ingesting the nonviable eggs (Somma, 1989).

Mountain skinks are known to move eggs in the nest, presumably to protect them from predators or to provide a more suitable temperature (Cruz-Sáenz et al., 2011). And prairie skinks may move their eggs when stressed in captivity (Somma, 1985).

Table 1. *Plestiodon callicephalus* egg measurements reported by Campbell and Simmons (1961) and Zweifel (1962).

Source	Egg	Length (mm)	Width (mm)
Campbell and Simmons (1961)	1	7	6
	2	7	6
	3	7	5
Zweifel (1962)	1	15.3	10.7
	2	12.7	8.0
	3	10.9	7.2

Table 2. Measurements of hatchling *P. callicephalus* by Campbell and Simmons (1961)

Hatchling	Snout–vent length (mm)	Tail length (mm)
1	23	31
2	24	32

Study site

Huaxtla is in northern Jalisco, UTM 664429 2315806, 1458 m above sea level. It is within the municipality of Zapopan and is 20 km northwest of the metropolitan area of Guadalajara. This site is accessed by the Federal Highway # 123 to Colotlán. Mountains here form part of Sierra de San Esteban; dominant vegetation is oak forest, with some patches of tropical deciduous forest on a few slopes and in ravines.

Material and methods

A female mountain skink was captured in the locality of Huaxtla. Lizards were collected between 22 June and 15 July 2012. Two nests were collected too. The female and the eggs collected in field were measured and weighed, as were the resulting hatchlings.

Results

The pregnant female laid the eggs over a period of four days: three eggs were laid on the first day, and one egg was laid on each of the second, third and fourth days, for a total of six eggs. After 26 days of incubation, we observed that the female had

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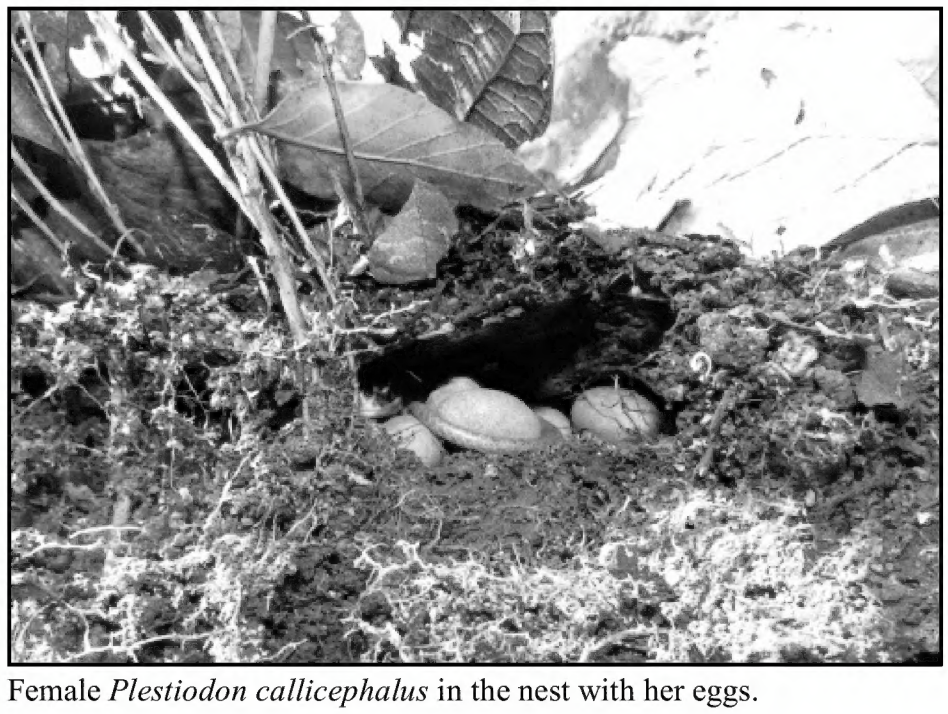
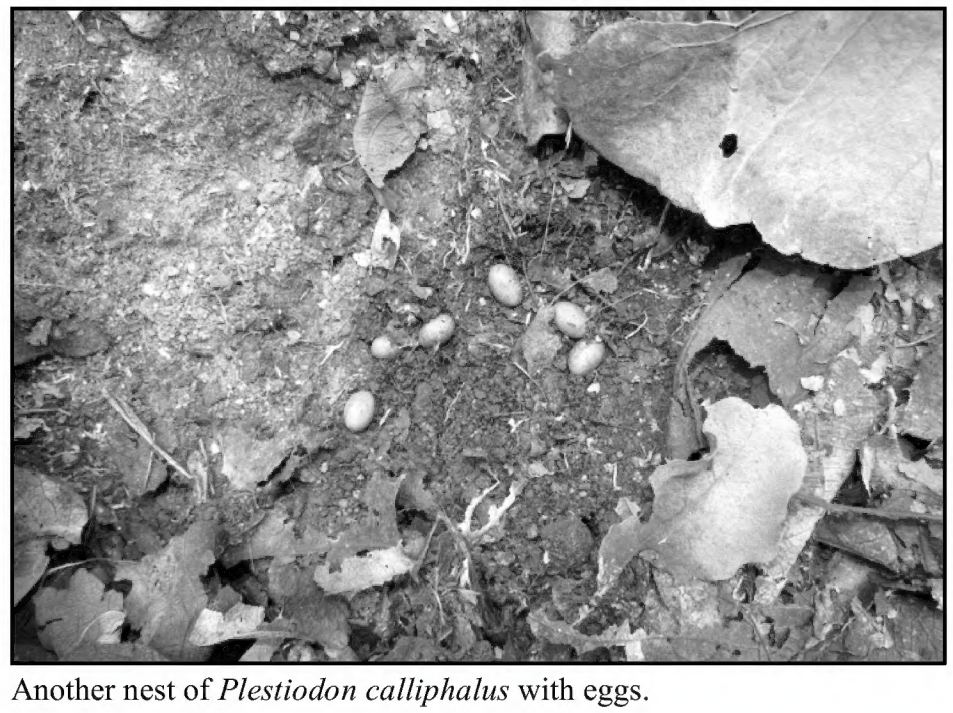
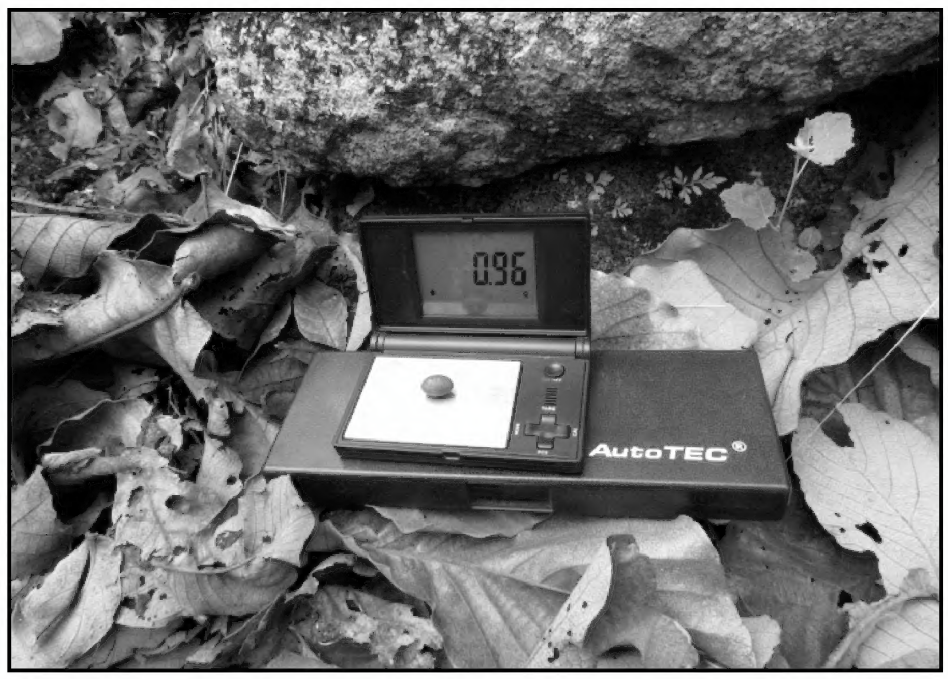


Female *Plestiodon callicephalus* in the nest with her eggs.



Another nest of *Plestiodon calliphalus* with eggs.



Weighing an egg.

Measuring an egg.

A *Plestiodon callicephalus* hatchling emerging from the egg.

Four hatchling *Plestiodon callicephalus*.

(All photographs by Daniel Cruz-Sáenz)

Table 3. Egg measurements from three nests of *Plestiodon callicephalus.*

Egg	Length (mm)	Width (mm)	Weight (g)
Nest 1			
1	12.35	7.97	0.42
2	12.43	7.80	0.42
3	11.67	8.00	0.40
4	11.44	7.43	0.34
5	11.44	5.82	0.22
6	10.80	6.02	0.23
Nest 2			
1	14.52	8.70	0.81
2	12.47	8.57	0.98
3	13.83	9.23	0.79
4	14.07	9.09	0.76
5	13.72	9.30	0.84
6	13.32	9.44	0.82
Nest 3			
1	18.97	11.48	1.55
2	17.88	10.74	1.50
3	18.42	11.11	1.52

eaten five eggs. Possibly these were infertile or rotten. After a month the last egg was opened: the embryo was alive but in an earlier stage of development than expected. We observed parental care behavior on some occasions when the female moved the eggs, probably for thermoregulation. The female laid six eggs; the second nest contained six eggs; the third nest contained six eggs, only three of which hatched.

Conclusions

Our observations of clutch size differ from Campbell and Simmons (1961): they report only three eggs. And also they report an average egg size of 7 × 6 mm, while we found a variety of sizes from 10.8 × 6 mm to 18 × 11 mm. Zweifel (1962) reported six eggs but he only described one nest. We found two nests with six eggs each, and the pregnant female also laid six eggs. Based on these observations, we assume that a clutch size of six eggs is normal for *Plestiodon callicephalus*. The biggest egg reported by Zweifel (1962) was 15.3 × 10.7 mm. We registered an egg of 18.47 × 11.48 mm. We registered the biggest hatchling: 26.78 mm SVL and 0.42 g in weight. Our study confirms parental care and oophagy for *P. callicephalus*.

Acknowledgments

We thank Alejandra Cueto-Mares, Francisco Muñoz Nolasco and Miguel Angel López Cuellar for their support with the fieldwork.

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Table 4. Measurements of hatchling *Plestiodon callicephalus* from three nests. SVL = snout–vent length; TL = tail length; HW = head width; HL = head length; HH = head height; FL = femur length; W = weight.

Hatchlings	SVL (mm)	TL (mm)	HW (mm)	HL (mm)	HH (mm)	FL (mm)	W (g)
Nest 1							
1*	22.04	24.82	3.88	5.32	3.18	2.25	0.25
Nest 2							
1	23.66	31.00	4.02	6.71	3.04	3.52	0.31
2	22.96	30.01	3.53	5.89	3.00	3.27	0.27
3	23.60	32.38	3.83	6.32	2.93	3.16	0.28
4	24.63	32.30	3.81	6.02	3.10	3.72	0.32
Nest 3							
1	24.81	33.70	4.08	6.52	3.35	2.90	0.40
2	25.15	35.44	3.72	6.11	3.27	3.28	0.37
3	26.78	36.07	4.28	6.27	3.27	3.39	0.42

* Measurements of live hatchling that was taken from the egg prematurely.

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

HOG-NOSED SNAKE NEST SITE SELECTION

C.A. Peet-Paré and G. Blouin-Demers [2012, Canadian J. Zoology 90(10):1215-1220] note that nest-site selection is an important behavior in oviparous reptiles because incubation conditions affect offspring phenotype, with favorable conditions leading to higher offspring fitness. They sought to identify the habitat characteristics involved in nest-site selection in eastern hog-nosed snakes (*Heterodon platirhinos*) and to determine whether females select nest sites that result in offspring with phenotypes likely to improve fitness. They compared the habitat characteristics and temperature profiles of 21 nests with 21 randomly selected sites. Eastern hog-nosed snakes selected open, grassy sites with fewer herbs and shrubs than random sites, and nests were significantly warmer than random sites during the 2 years of the study. In the second year of the study, they incubated 215 eggs from eight nests in a split-clutch design at mean nest (24°C) and random site (22°C) temperatures approximating those of the first year of the study. Eggs incubated at 24°C resulted in neonates that hatched earlier, had fewer scale anomalies, were larger, and swam faster than neonates from eggs incubated at 22°C. These results indicate that eastern hog-nosed snakes select nest sites that lead to offspring with phenotypes likely to improve fitness.

URBAN VERSUS BUSH LIZARD POPULATIONS

S. Iglesias et al. [2012, J. Herpetology 46(3):297-303] note that body size and morphology are important traits that can strongly influence the life history of an organism. One important factor affecting these traits is habitat. Urbanization has resulted in the significant modification of many habitats, and thus, it may be a factor affecting the body size and morphology of species living in the urban environment. This study compared body size and morphology in urban and bush populations of the lizard *Lophognathus temporalis* in and around Darwin, Australia. Monthly measurements were made of invertebrate abundance and soil moisture during one year to compare seasonal variation in resource availability between habitats. All matter excreted by *L. temporalis* during their first four days in captivity was collected as an index of food consumption in the field. It was found that male *L. temporalis* were larger than females and that urban *L. temporalis* were larger than bush *L. temporalis*. Males had longer front limbs, hind limbs, and tails than did females; and in urban populations, they also had larger heads. Urban *L. temporalis* had longer front and hind limbs than did bush *L. temporalis*, although head size and tail length were similar for both groups. Resource availability was seasonally more stable in urban habitats than in bush habitats, and urban *L. temporalis* consumed more than bush *L. temporalis* all year round. The authors conclude that differences in resource abundance between habitats may be an important factor contributing to the morphological differences between urban and bush-dwelling *L. temporalis*.

CRAWFISH FROG BREEDING MIGRATIONS

J. L. Heemeyer and M. J. Lannoo [2012, Copeia 2012(3): 440-450] note that movements are risky behaviors to animals, and amphibians are no exception, yet most species of amphibians exhibit cyclic annual movements. Crawfish frogs (*Lithobates areolatus*) are a relatively understudied species of North American amphibian considered to be "Near Threatened" globally. To better understand the biology of this species, and in particular to assess the role that movements play in affecting survivorship, the authors radio tracked 48 crawfish frog adults in 2009–2010. The study encompassed a total of 7,898 telemetered-frog days; individual frogs were tracked for up to 606 days. The data demonstrate two behaviors previously undocumented in this species: 1) migration distances that averaged nearly 0.5 km, and for one frog was approximately 1.2 km; and 2) philopatry to upland burrows excavated by crayfish. Together, these findings indicate that crawfish frogs have a remarkable ability to home to distant upland burrow sites. Burrow fidelity in crawfish frogs involves, in part, following similar migration routes to and from breeding wetlands. Burrow fidelity also occurs after ranging movements, and again often involves individual frogs following the same circuit across years. The authors demonstrate that movements are hazardous for crawfish frogs (about 12 times riskier than burrow dwelling), and therefore have survival consequences. The data further suggest that adult crawfish frogs are not typically moving long distances from one upland burrow to another to populate new sites; instead two mechanisms—adults varying breeding wetlands across years and juvenile dispersion—are primarily responsible for the colonization of new habitats.

CHIRICAHUA LEOPARD FROGS FROM DURANGO

J. W. Streicher et al. [2012, J. Herpetology 46(3):387-392] note that the Chiricahua leopard frog (*Lithobates chiricahuensis*) occurs in parts of the southwestern United States and northwestern Mexico. In the United States, it is listed as a federally threatened species. Although extensive research has been conducted on populations in the United States, the status of most Mexican populations is unknown. The authors used mitochondrial and nuclear DNA to identify a population of *L. chiricahuensis* from the Mexican state of Durango. To better characterize this poorly known population, they examined morphological variation in 30 individuals that included adult males, adult females, and subadult females. Multivariate analyses of 21 size-adjusted body measurements revealed putative shifts in body dimensions associated with gender and ontogeny. Additionally, notable color pattern variation was observed in female specimens. Field observations from 2008 suggest that this population is large and thriving. In light of this, a more comprehensive examination may yield valuable conservation insights and have implications for the management of declining *L. chiricahuensis* populations in the United States.

SCHOOLCHILDREN AND SNAKES

J.-M. Ballouard et al. [2012, J. Herpetology 46(3):423-428] note that the general public prefers to support conservation projects that focus on a few, easily "loveable" species; consequently most of biodiversity is neglected. It is essential to redress such bias and to educate children about the value of a wide diversity of organisms, including those labeled by social bias as less appealing. Because snakes are among the most disliked animals, they are suitable candidates for such endeavor. This study evaluated the impact of a single field trip on the attitudes of more than 500 schoolchildren. The participants were involved in snake catching and were allowed to manipulate nonvenomous snakes. The organizers limited their intervention to providing natural history information and carefully avoided saying that snakes should be protected. Pre- and post-field trip questionnaires were used to gauge the feelings of the children. Although pre-surveys suggested that many schoolchildren like snakes a priori, their attitudes improved following field experience: almost all children declared then that they liked snakes and expressed a strong willingness to protect them. Such change was associated with an increase of the frequency in the responses of the terms linked with affectivity (e.g., "snakes are cute . . ."). Snake handling was the favorite activity, and physical contact with animals appears to be a crucial element to improve schoolchildren's attitude for an unpopular organism. Results support the promotion of field trips that include physical contact with wildlife over the current trend in the educational systems that promote virtual approaches.

REASSESSMENT OF A TURTLE COMMUNITY

A. L. Pitt and M. A. Nickerson [2012, Copeia 2012(3):367-374] in an effort to identify long-term changes in a river turtle community and its habitat, reexamined the turtle community in a 4.6 km section of the North Fork of White River, Ozark County, Missouri, that was previously studied between 1969 and 1980. They compared data collected in 2004 to data from 1969 and 1980 to determine if alterations in the habitat, community composition, or northern map turtle (*Graptemys geographica*) population size and structure had occurred. Previous studies showed that the population of *G. geographica* declined between 1969 and 1980. The authors' results indicate that the population of *G. geographica* failed to rebound by 2004. The population of red-eared sliders (*Trachemys scripta elegans*) that established in the research section between 1971 and 1980 expanded their distribution between 1980 and 2004. Threats to the population of *G. geographica* included lack of basking sites, increased human recreational use of the stream, and water quality degradation.

PARENTAL CARE BY FRESHWATER CROCODILES

R. Somaweera and R. Shine [2012, J. Herpetology 46(3):407-411] used remote video cameras to record eight instances of nest excavation and parental transport of offspring to the water by Australian freshwater crocodiles (*Crocodylus johnstoni*) inhabiting Lake Argyle in northwestern Australia. This provides the first in-detail documentation of hatchling transport in this species. Parental assistance during hatching appears to be vital for successful emergence of hatchlings from nests in this area.

DISPERSAL OF NEONATE TIMBER RATTLESNAKES

J. M. Howze et al.[2012, J. Herpetology 46(3):417-422] note that in colder climates, survival of neonate timber rattlesnakes (*Crotalus horridus*) following dispersal relies heavily on conspecific scent trailing and the ability to locate suitable communal hibernacula. Less is known regarding populations in the southern portion of their range where they are more likely to den solitarily in ephemeral overwintering sites. On 6 August 2009, the authors captured a post-parturient female timber rattlesnake with a litter of 23 neonates in a hardwood thicket within a Longleaf Pine (*Pinus palustris*) forest in southwestern Georgia. Fourteen of the neonates were radio-tracked to examine their movements and activity range overlap as they dispersed from the natal site. Snakes were tracked for periods of 1–110 days, daily for the first three weeks and at least three times per week thereafter. Dispersal distances increased over time, and overlap of activity ranges was minimal, potentially reducing intraspecific competition between litter mates. Neonates were located predominantly beneath clumps of vegetation or beside coarse woody debris (62.4%), in hardwood tree branches (31.6%), or just off the ground in vegetation or on top of course woody debris (6.0%). Selection of appropriate cover structure may aid in reducing susceptibility to predation.

ACTIVITY OF EASTERN KINGSNAKES

J. M. Howze and L. L. Smith [2012, Copeia 2012(3):460-464] used radio-telemetry to identify diel activity patterns in the eastern kingsnake, *Lampropeltis getula getula* in southwestern Georgia. Tagged snakes were monitored at four time periods within a 24-hour cycle (0800–1359 h, 1400–1959 h, 2000–0159 h, and 0200–0759 h) in spring, summer, and fall (March–November), which comprise the annual activity period for eastern kingsnakes in this region. A logistic regression approach was used to identify specific environmental factors that best predicted eastern kingsnake movement. It was found that eastern kingsnakes were primarily active during the day in the spring and activity was best predicted by air temperature, soil temperature, relative humidity, and light intensity. These observations differed from anecdotal descriptions of nocturnal activity and seasonal shifts in diel activity patterns in eastern kingsnakes.

YELLOW MUD TURTLES ON THE DECLINE

J. L. Christiansen et al. [2012, The Southwestern Naturalist 57(3): 304-313] note that studies of the yellow mud turtle, *Kinosternon flavescens*, in the late 1970s and 1980s documented eight clusters of localities in nine counties in Illinois, five in four counties in Iowa, and five in two counties in Missouri. Sampling that began in 1995 verified continued existence of the species at only two localities in Illinois, two in Iowa, and one in Missouri. Severe declines have occurred in the largest population in each of these states. In all three states, lowered water levels, usually due to withdrawal of water from aquifers, have contributed at least partly to some of the declines. Water has disappeared from some ponds for multiple years. Other contributors are encroachment of woody plants on nesting habitats or between nesting areas and aquatic feeding areas, which often are associated with heavy predation on turtles and nests by mesopredators.

WHIP SNAKE DISPERSAL PATTERNS

L. Rugiero et al. [2012, The Herpetological Journal 22(4): 259-261] investigated the dispersal of hatchlings from a communal nesting site of the oviparous colubrid snake *Hierophis viridiflavus* using mark-recapture data from a 17-year study. Hatchlings lighter at birth were found to disperse more than heavier ones, but after one year there was no difference in body mass between individuals that rested close to their birth site and those that dispersed further. The authors interpret this result as an adaptive behavior in which heavier newborn snakes are less inclined to disperse from the hatching site, whereas lighter snakes move further away to increase their foraging efficiency.

NUCHAL GLANDS AND ANTIPREDATOR DISPLAYS

H. Takeuchi and A. Mori [2012, Current Herpetology 31(1): 47-53] note that several Asian natricine snakes are known to possess special organs called nuchal glands. Extensive studies on the nuchal glands of *Rhabdophis tigrinus* have shown that the glands contain cardiac steroidal toxins known as bufadienolides, which are sequestered from its toad prey and are stored in the nuchal glands as defensive substances. In addition, several species of snakes with nuchal glands exhibit unique behaviors to enhance the effects of the glands (nuchal gland-related behaviors). *Macropisthodon rudis* is the only species that does not have the nuchal glands in the genus. The authors investigated its antipredator displays and chemical preference for toads to gain insight into the evolution of the nuchal glands. The results showed that *M. rudis* does not exhibit the nuchal gland-related behaviors such as neck arching, neck butting, and dorsal-facing posture. Additionally, this species showed high preference for toad chemicals. These results support a previous hypothesis that preference for toads predates the evolution of the nuchal glands and that the unique antipredator behaviors have evolved to enhance the defensive efficiency of the glands.

GENETIC CRISIS OF THE BOLSON TORTOISE

C. A. Ureña-Aranda and A. E. de los Monteros [2012, Amphibia–Reptilia 33(1):45-53] note that *Gopherus flavomarginatus* (Testudinidae) is endemic to a series of discontinuous, isolated basins collectively known as the Bolson de Mapimí in the Chihuahuan Desert. Its numbers declined after catastrophic levels of exploitation during the mid-20th century. However currently, the bolson tortoise appears to be on a path to recovery owing to intensive, sustained conservation efforts. The authors sequenced an 842-bp-long fragment of the D-loop from 76 individuals distributed throughout the species' range. The results revealed only two haplotypes. An AMOVA showed that 95% of the variance occurred among populations, whereas the remaining 5% was explained by genetic differences within populations. Tectonic processes together with ecological transformation during the Pleistocene and Holocene may be responsible for the reduction in this species' genetic variation. A bottleneck during which a significant percentage of the haplotype diversity was lost would result in genetic homogeneity. Although there is demographic growth, the lack of genetic diversity is indicative of the potential crisis that the bolson tortoise is facing, and awareness must be brought to this situation.

CUES USED BY WOOD FROGS

V. D. Popescu et al. [2012, Copeia 2012(3):424-431] note that juvenile amphibians are capable of long-distance upland movements, yet cues used for orientation during upland movements are poorly understood. Newly metamorphosed wood frogs (*Lithobates sylvaticus*) were used to investigate: (1) the existence of innate (i.e., inherited) directionality, and (2) the use of olfactory cues, specifically forested wetland and natal pond cues during emigration. In a circular arena experiment, animals with assumed innate directionality did not orient in the expected direction (suggested by previous studies) when deprived of visual and olfactory cues. This suggests that juvenile wood frogs most likely rely on proximate cues for orientation. Animals reared in semi-natural conditions (1500-l cattle tanks) showed a strong avoidance of forested wetland cues in two different experimental settings, although they had not been previously exposed to such cues. This finding is contrary to known habitat use by adult wood frogs during summer. Juvenile wood frogs were indifferent to the chemical signature of natal pond (cattle tank) water. These findings suggest that management strategies for forest amphibians should consider key habitat features that potentially influence the orientation of juveniles during emigration movements, as well as adult behavior.

ANTIPREDATOR BEHAVIOR IN WALL LIZARDS

J. Durand et al. [2012, Amphibia–Reptilia 33(2):199-206] note that alteration in anti-predatory behavior following geographic isolation has been observed in a number of taxa. Such alteration was attributed to the effect of relaxed selection in the novel environment, reinforced by the cost of anti-predatory behaviors. The authors studied aspects of anti-snake behavior in 987 adult and juvenile wall lizards *Podarcis muralis* from two mainland areas (heavy snake predatory pressure) and two islands (low snake predatory pressure), isolated from the mainland 5000 and 7000 years ago. They conducted a scented retreat site choice experiment using the odors of five different snake species (saurophagous, piscivorous or generalist feeder). Mainland lizards avoided shelters scented by saurophagous snakes, but not those scented by non-saurophagous snake species. Long isolated lizards (7000 years ago) showed no antipredator response to any snake, suggesting a total loss of antipredatory behavior towards saurophagous snakes. More recently isolated lizards (5000 years ago) however showed anti-snake behavior towards a former sympatric adder species, and a tendency to avoid the scent of a sympatric generalist feeder snake. There was no difference in the anti-snake responses between adult and juvenile wall lizards from all four sites, suggesting a limited role for experience (behavioral plasticity) in the expression of anti-snake behavior in wall lizards.

Unofficial Minutes of the CHS Board Meeting, October 19, 2012

The meeting was called to order at 7:51 P.M. at the Schaumburg Public Library. Board members Lawrence Huddleston, Barbara Khan, Deb Krohn, Linda Malawy, Cindy Rampacek and Jenny Vollman were absent. A quorum was not present.

Officers' Reports

Recording Secretary: The minutes of the September 14, 2012, board meeting were read and accepted.

Treasurer: The September financial report was presented, discussed and accepted.

Membership Secretary: Membership numbers are holding steady around 500. A list of newly expired memberships was read.

Publications Secretary: The announcement of the 2013 CHS Grants program is up on our website.

Sergeant-at-arms:Attendance at the September general meeting was 39

Committee Reports

Shows:
• Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
• Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.

Old Business

Junior Herpers club: Background checks will be done on those CHS adult members who have volunteered to help with this.

Banners: Jason is going to get another banner made, which will incorporate some suggested improvements.

Herps of Illinois: Jason likes http://herpsofarkansas.com and would like to model our Herps of Illinois web page after it.

New Business

CHS Email: Was broken and is now fixed. Large quantities of undeleted spam in the mailboxes of various board members have been bogging down the system and causing problems.

Show Guidelines: We need to specify the purpose, goals, and expectations of the society to our volunteers representing the CHS at shows.

Round Table

Jessica Tschampa is going to Connecticut for an art show and is bringing ReptileFest cards.

Aaron LaForge had a swell time at the NARBC auction.

Nancy Kloskowski found a box turtle labeled as a Russian tortoise at a pet shop.

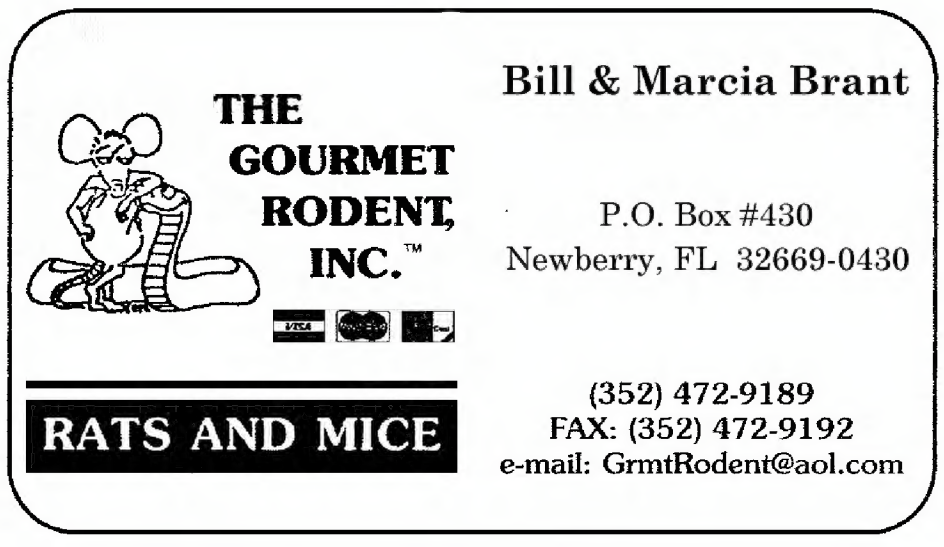
Mike mentioned a recent study that showed Chinese soft-shelled turtles excrete more urea through cells in their mouths than through their cloaca.

Dick brought snakes to a fashion show at the Notebaert and they were well received.

Jason has baby tree boas again this year.

The meeting was adjourned at 9:07 P.M.

Respectfully submitted for the recording secretary by Aaron LaForge



Advertisements

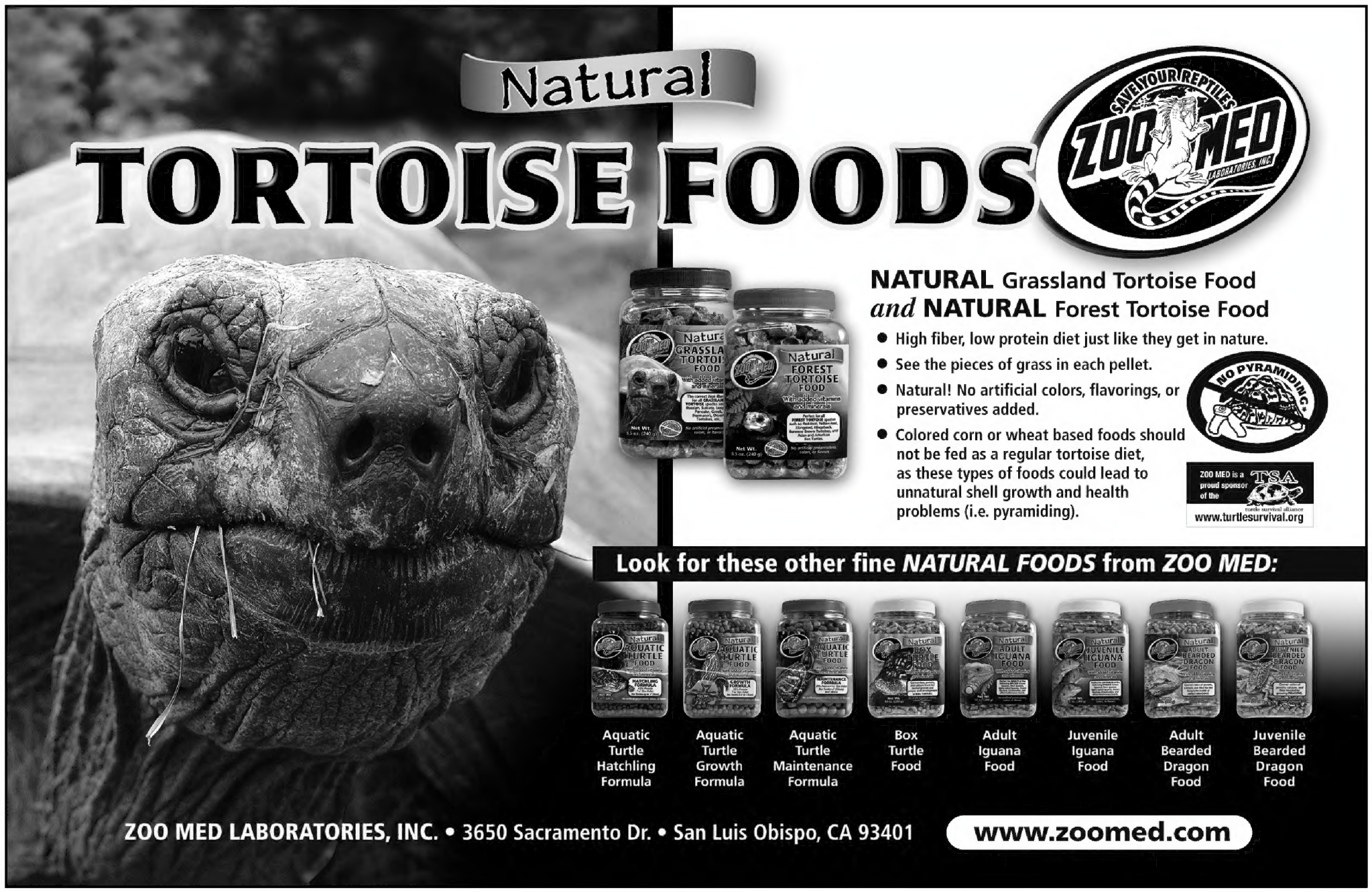
For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, November 28, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This meeting will include the annual election of officers and members-at-large of the CHS Board of Directors. Also at this meeting local CHS member **Julie tenBensel** will present "Dragons in Our Midst," a program dealing with the proper husbandry of monitor lizards.

The December 26 meeting meeting will be a holiday party. The CHS will provide soft drinks and snacks. If you would like to bring something edible to share with the group, you are invited to do so. If you would like to bring an animal to show off to the group, you are encouraged to do that as well. This will be a chance to socialize all evening and get to know your fellow members a little better.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

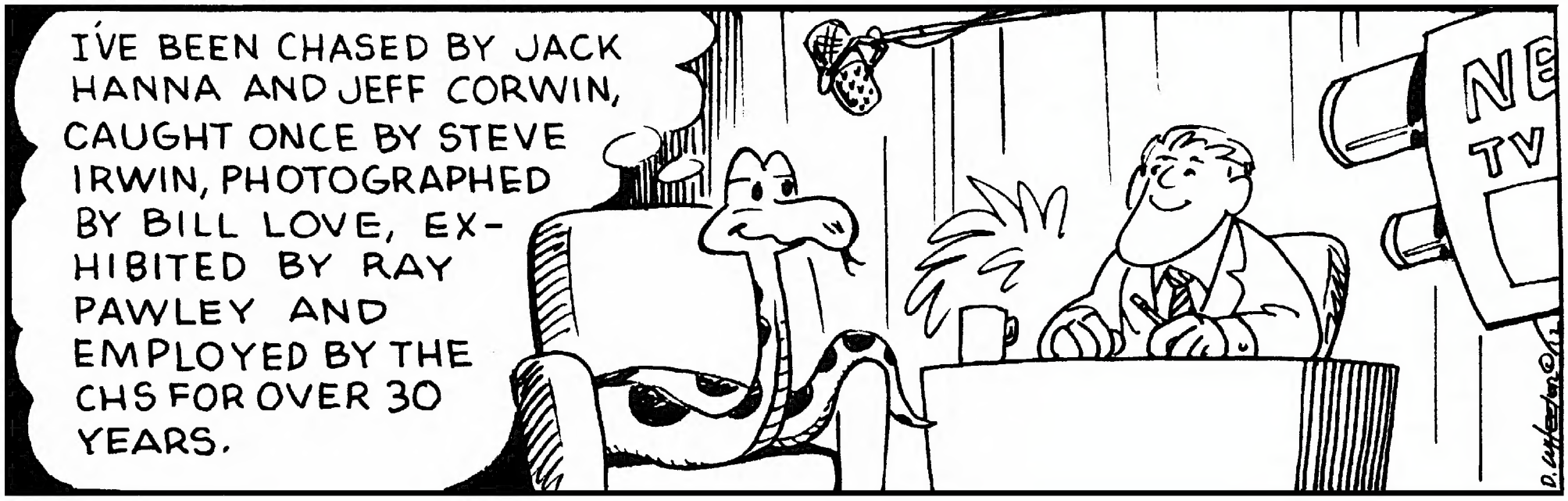
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., December 14, at the home of Linda and Andy Malawy in Naperville. If you wish to attend, please call Linda at (630) 717-9955..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT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